

THE CLAIMS

We claim:

1. A golf ball having a diameter and being comprised of a core and a cover, wherein the core is further comprised of a fluid mass at the center of the ball, a first mantle layer surrounding the fluid mass and a second, solid, non-wound mantle layer surrounding and abutting the first mantle layer, wherein the first mantle layer comprises a polymer material selected from the group consisting of a thermoset rubber, plastic and thermoplastic elastomeric material and the second mantle layer comprises a polymer material selected from the group consisting of a thermoset rubber material and thermoplastic elastomeric material, and wherein the cover comprises polyurethane, polyurea, or a polyurea/polyurethane hybrid.
2. The golf ball of claim 1, wherein the fluid mass is a gas, liquid, gel, paste or a combination thereof.
3. The golf ball of claim 1, wherein the fluid mass is a liquid having a low coefficient of thermal expansion or high boiling point.
4. The golf ball of claim 3, wherein the liquid having a low coefficient of thermal expansion or high boiling point is selected from the group consisting of an oil, a polyol and mixtures thereof.
5. The golf ball of claim 2, wherein the fluid mass is a gas, wherein the gas is selected from the group consisting of air, nitrogen, helium, argon, neon, carbon dioxide, nitrous oxide and mixtures thereof.
6. The golf ball of claim 1, wherein the first mantle layer comprises dynamically vulcanized thermoplastic elastomer, functionalized styrene-butadiene elastomer, thermoplastic polyurethane, thermoplastic polyetherester or polyetheramide, thermoplastic ionomer resin, thermoplastic polyester, metallocene polymer or blends thereof.
7. The golf ball of claim 1, wherein the cover comprises an inner cover layer and a thin outer cover layer, wherein the outer cover layer comprises a thermoset material formed from a castable, reactive liquid and the inner cover layer comprises a high flexural modulus material.

8. The golf ball of claim 1, wherein the core, cover, first mantle layer or second mantle layer comprises a polymer containing an acid group that is neutralized by an organic acid or a salt thereof, the organic acid or salt thereof being present in an amount sufficient to neutralize the polymer by at least about 70%.

5 9. The golf ball of claim 8, wherein the polymer comprises ionomeric copolymers and terpolymers, ionomer precursors, thermoplastics, thermoplastic elastomers, polybutadiene rubber, balata, grafted metallocene-catalyzed polymers, non-grafted metallocene-catalyzed polymers, single-site polymers, high-crystalline acid polymers, cationic ionomers, and mixtures thereof.

10 10. The golf ball of claim 8, wherein the organic acid is selected from the group consisting of aliphatic organic acids, aromatic organic acids, saturated mono-functional organic acids, unsaturated mono-functional organic acids, and multi-unsaturated mono-functional organic acids.

15 11. The golf ball of claim 8, wherein the salt of organic acids comprise barium, lithium, sodium, zinc, bismuth, chromium, cobalt, copper, potassium, strontium, titanium, tungsten, magnesium, cesium, iron, nickel, silver, aluminum, tin, and calcium salts of stearic acid, behenic acid, erucic acid, oleic acid, linoelic acid, dimerized derivatives, and mixtures thereof.

12. The golf ball of claim 1, wherein the golf ball diameter is at least 1.68 inches.

20 13. The golf ball of claim 12, wherein the first mantle layer has an inner diameter of about 0.75 to 1.1 inches.

14. The golf ball of claim 1, wherein the core diameter is about 1.590 inches or greater.

25 15. The golf ball of claim 1, wherein the cover has a thickness of from about 0.015 to 0.12 inches.

16. The golf ball of claim 1, wherein the first mantle layer or second mantle layer further comprises a halogenated thiophenol.

17. The golf ball of claim 1, wherein the halogenated thiophenol is zinc pentachlorothiophenol.

18. The golf ball of claim 1, wherein the cover comprises polyether thermoplastic urethane, polyester thermoplastic urethane, thermoset polyurethane, polyurea, or
5 polyurethane/polyurea hybrid that is formed from an isocyanate prepolymer.

19. The golf ball of claim 18, wherein the isocyanate prepolymer is paraphenylene diisocyanate.

20. The golf ball of claim 1 having a moment of inertia of greater than 0.460 oz-in².

10 21. The golf ball of claim 1 having a moment of inertia of less than 0.450 oz-in².

22. A golf ball having a diameter and being comprised of a core and a cover, wherein the core is further comprised of a fluid mass at the center of the ball, a first mantle layer surrounding the fluid mass and a second, solid, non-wound mantle layer surrounding and abutting the first mantle layer, wherein the first mantle layer comprises a polymer
15 material selected from the group consisting of a thermoset rubber, plastic and thermoplastic elastomeric material and the second mantle layer comprises a polymer material selected from the group consisting of a thermoset rubber material and thermoplastic elastomeric material, and wherein the cover comprises material selected from the group consisting of polyether thermoplastic urethane, polyester thermoplastic urethane, thermoset polyurethane, ionomer
20 resins, low modulus ionomers, high modulus ionomers and blends thereof.

23. The golf ball of claim 22, wherein the cover comprises a thermoset polyurethane.

24. The golf ball of claim 22, wherein the fluid mass is a liquid having a low coefficient of thermal expansion or high boiling point.

25 25. The golf ball of claim 24, wherein the liquid having a low coefficient of thermal expansion or high boiling point is selected from the group consisting of an oil, a polyol and mixtures thereof.

26. The golf ball of claim 22, wherein the fluid mass is a gas, wherein the gas is selected from the group consisting of air, nitrogen, helium, argon, neon, carbon dioxide, nitrous oxide and mixtures thereof.

27. The golf ball of claim 22, wherein the first mantle layer comprises
5 dynamically vulcanized thermoplastic elastomer, functionalized styrene-butadiene elastomer, thermoplastic polyurethane, thermoplastic polyetherester or polyetheramide, thermoplastic ionomer resin, thermoplastic polyester, metallocene polymer or blends thereof.

28. The golf ball of claim 22, wherein the cover comprises an inner cover layer
10 and a thin outer cover layer, wherein the outer cover layer comprises a thermoset material formed from a castable, reactive liquid and the inner cover layer comprises a high flexural modulus material.

29. The golf ball of claim 22, wherein the core, cover, first mantle layer or second
15 mantle layer comprises a polymer containing an acid group that is neutralized by an organic acid or a salt thereof, the organic acid or salt thereof being present in an amount sufficient to neutralize the polymer by at least about 70%.

30. The golf ball of claim 29, wherein the polymer comprises ionomeric
20 copolymers and terpolymers, ionomer precursors, thermoplastics, thermoplastic elastomers, polybutadiene rubber, balata, grafted metallocene-catalyzed polymers, non-grafted metallocene-catalyzed polymers, single-site polymers, high-crystalline acid polymers, cationic ionomers, and mixtures thereof.

31. The golf ball of claim 29, wherein the organic acid is selected from the group
consisting of aliphatic organic acids, aromatic organic acids, saturated mono-functional organic acids, unsaturated mono-functional organic acids, and multi-unsaturated mono-functional organic acids.

25 32. The golf ball of claim 29, wherein the salt of organic acids comprise barium, lithium, sodium, zinc, bismuth, chromium, cobalt, copper, potassium, strontium, titanium, tungsten, magnesium, cesium, iron, nickel, silver, aluminum, tin, and calcium salts of stearic acid, behenic acid, erucic acid, oleic acid, linoelic acid, dimerized derivatives, and mixtures thereof.

33. The golf ball of claim 22, wherein the golf ball diameter is at least 1.68 inches.

34. The golf ball of claim 22, wherein the first mantle layer has an inner diameter of about 0.75 to 1.1 inches.

35. The golf ball of claim 22, wherein the core diameter is about 1.590 inches or
5 greater.

36. The golf ball of claim 22, wherein the cover has a thickness of from about 0.015 to 0.12 inches.

37. The golf ball of claim 22, wherein the first mantle layer or second mantle layer further comprises a halogenated thiophenol.

10 38. The golf ball of claim 22, wherein the halogenated thiophenol is zinc pentachlorothiophenol.

39. The golf ball of claim 22 having a moment of inertia of greater than 0.460 oz-in².

40. The golf ball of claim 22 having a moment of inertia of less than 0.450 oz-in².

15 41. A golf ball having a diameter and being comprised of a core and a cover, wherein the core is further comprised of a fluid mass at the center of the ball, a first mantle layer surrounding the fluid mass and a second, solid, non-wound mantle layer surrounding and abutting the first mantle layer, wherein the first mantle layer comprises a polymer material selected from the group consisting of a thermoset rubber, plastic and thermoplastic
20 elastomeric material and the second mantle layer comprises two or more layers, each made from material that comprises a polymer material selected from the group consisting of a thermoset rubber material and thermoplastic elastomeric material.

42. The golf ball of claim 41, wherein the thermoset rubber material is selected from the group consisting of polyisoprene, styrene butadiene, polybutadiene and mixtures
25 thereof.

43. The golf ball of claim 41, wherein the thermoplastic elastomeric material is selected from the group consisting of copolymers of methyl-methacrylate with butadiene and styrene, copolymers of methyl-acrylate with butadiene and styrene, acrylonitrile styrene

copolymers, polyether-ester, polyether-amide, polyurethane, propylene/ethylene-propylene-
diene rubber, styrene-butadiene elastomers, metallocene polymers, polyetheresters,
polyetheramides, ionomer resins, polyesters, and blends thereof.

5 44. The golf ball of claim 41, wherein the fluid mass is a liquid having a low
coefficient of thermal expansion or high boiling point.

45. The golf ball of claim 44, wherein the liquid having a low coefficient of
thermal expansion or high boiling point is selected from the group consisting of an oil, a
polyol and mixtures thereof.

10 46. The golf ball of claim 41, wherein the fluid mass is a gas, wherein the gas is
selected from the group consisting of air, nitrogen, helium, argon, neon, carbon dioxide,
nitrous oxide and mixtures thereof.

15 47. The golf ball of claim 41, wherein the first mantle layer comprises
dynamically vulcanized thermoplastic elastomer, functionalized styrene-butadiene elastomer;
thermoplastic polyurethane, thermoplastic polyetherester or polyetheramide, thermoplastic
ionomer resin, thermoplastic polyester, metallocene polymer or blends thereof.

48. The golf ball of claim 41, wherein the cover comprises an inner cover layer
and a thin outer cover layer, wherein the outer cover layer comprises a thermoset material
formed from a castable, reactive liquid and the inner cover layer comprises a high flexural
modulus material.

20 49. The golf ball of claim 41, wherein the core, cover, first mantle layer or second
mantle layer comprises a polymer containing an acid group that is neutralized by an organic
acid or a salt thereof, the organic acid or salt thereof being present in an amount sufficient to
neutralize the polymer by at least about 70%.

25 50. The golf ball of claim 49, wherein the polymer comprises ionomeric
copolymers and terpolymers, ionomer precursors, thermoplastics, thermoplastic elastomers,
polybutadiene rubber, balata, grafted metallocene-catalyzed polymers, non-grafted
metallocene-catalyzed polymers, single-site polymers, high-crystalline acid polymers,
cationic ionomers, and mixtures thereof.

51. The golf ball of claim 49, wherein the organic acid is selected from the group consisting of aliphatic organic acids, aromatic organic acids, saturated mono-functional organic acids, unsaturated mono-functional organic acids, and multi-unsaturated mono-functional organic acids.

5 52. The golf ball of claim 49, wherein the salt of organic acids comprise barium, lithium, sodium, zinc, bismuth, chromium, cobalt, copper, potassium, strontium, titanium, tungsten, magnesium, cesium, iron, nickel, silver, aluminum, tin, and calcium salts of stearic acid, behenic acid, erucic acid, oleic acid, linoelic acid, dimerized derivatives, and mixtures thereof.

10 53. The golf ball of claim 41, wherein the golf ball diameter is at least 1.68 inches.

54. The golf ball of claim 53, wherein the first mantle layer has an inner diameter of about 0.75 to 1.1 inches.

55. The golf ball of claim 41, wherein the core diameter is about 1.590 inches or greater.

15 56. The golf ball of claim 41, wherein the cover has a thickness of from about 0.015 to 0.12 inches.

57. The golf ball of claim 41, wherein the first mantle layer or second mantle layer further comprises a halogenated thiophenol.

20 58. The golf ball of claim 41, wherein the halogenated thiophenol is zinc pentachlorothiophenol.

59. The golf ball of claim 41 having a moment of inertia of greater than 0.460 oz-in².

60. The golf ball of claim 41 having a moment of inertia of less than 0.450 oz-in².